

WHAT IS CLAIMED IS:

1. A method of retrofitting an ultrasonic, unitized fuel injector apparatus for injection of pressurized liquid fuel into an internal combustion engine that actuates the injector by overhead cams, this injector including a needle valve that can be biased in the valve's closed position as the valve seat is sealed against
5 one end of the needle while the opposite end of the needle engages an overhead cam that actuates the opening and closing of the needle valve, and thus controls the supply of fuel through the exit orifices of the injector into the combustion chamber that is served by the injector, the method comprising:

removing the injector's needle and substituting therefor a needle that has
10 an elongated portion that is composed of magnetostrictive material;

hollowing out the portion of the injector's body surrounding the magnetostrictive portion of the retrofitted needle;

providing an annular shaped insert that defines a wall that is transparent to magnetic fields oscillating at ultrasonic frequencies and disposing said insert
15 into said hollowed out the portion of the injector's body so that said insert surrounds said magnetostrictive portion of the retrofitted needle;

surrounding the exterior of said wall by a coil that is capable of inducing a changing magnetic field in the region occupied by the magnetostrictive portion and thus causing the magnetostrictive portion to vibrate at ultrasonic frequencies;
20 and

disposing on the injector a sensor that is configured to detect when at least one of the cams is actuating the injector to inject fuel into the combustion chamber of the engine.

2. The method of claim 1, further comprising the steps of:

electrically connecting said coil to an ultrasonic power source;

electrically connecting said sensor to a control that is electrically connected to said power source and that is configured to activate said power source only when said sensor signals that said one of the cams is actuating the injector to inject fuel into the combustion chamber of the engine.

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